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AN EXAMINATION OF DATA ON IOWA SCHOOL CHILDREN TO DETERMINE PATTERNS OF PERFORMANCE AND "DOWNSTREAM EFFECTS" OF EARLY DEPRESSED SCORES.

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VARIOUS PERFORMANCE PATTERNS WERE STUDIED TO DETERMINE IF EARLY LIMITED FAILURE LEADS TO GENERALIZED FAILURE IN A NUMBER OF AREAS. THE SUBJECTS, 258 DISADVANTAGED URBAN CHILDREN FROM FOUR SCHOOL DISTRICTS IN IOWA, HAD ONE OR MORE SCORES ON THE IOWA TEST OF BASIC SKILLS (ITBS) AT OR BELOW THE 33D PERCENTILE ON NATIONAL NORMS. THEIR PERFORMANCES ON THE ITBS AND THE IOWA TEST OF EDUCATIONAL DEVELOPMENT WERE FOLLOWED FOR 12 YEARS. SUBJECTS WHO DID POORLY INITIALLY ON A NUMBER OF SUBTESTS TENDED TO CONTINUE TO DO POORLY. SUBJECTS WHO DID POORLY INITIALLY IN ONE OR TWO AREAS OF THE ITBS AND WELL IN OTHER AREAS TENDED TO MOVE TOWARD THE MEAN. THE PERFORMANCE WAS RATHER MIXED. SOME DIFFICULTY WAS ENCOUNTERED IN OBTAINING LONGITUDINAL DATA BECAUSE OF POOR ATTENDANCE, TRANSFERS, AND DROPOUT PROBLEMS. THE AUTHOR CONCLUDED THAT A SIGNIFICANT NUMBER OF THOSE WHO INITIALLY PERFORM MARGINALLY ON ITBS LANGUAGE SUBTESTS WILL SHOW "DOWNSTREAM EFFECTS." FURTHER RESEARCH WAS NEEDED. (SK)

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Division of Operations Analysis

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NATIONAL CENTER FOR EDUCATIONAL STATISTICS
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An Examination of Data on Iowa School Children to Determine Patterns of Performance and "Downstream Effects" of Early Depressed Scores

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THE PROBLEM

A major concern of the Office of Education in the provision of programs under Title I grants is selection of the best combination of programs for a given school district. It is assumed that different problems found in the schools will require different solutions. Thus, it is important to have a basis for selecting from alternative programs which can be applied. A second major concern of the Office of Education is the high school dropout. It has long been recognized by educators that the causes of dropout among students do not arise in high school, but rather this phenomenon is the result of many earlier experiences, both in and out of school.

One characteristic of high school dropouts is a long history of poor performance, probably beginning back in elementary school. While common sense suggests that there would have been numerous studies of individual student's performance over the years, such has not been the case. In fact, due to different school policies, different community characteristics, and different course curricula, there is little data available to apply to the question: What are the key points of failure which have later effects on a pupil's career? Of particular interest to Abt Associates in the development of the OECE model was the "pattern of downstream effects". This concept implies that failure to perform satisfactorily in early grades will have an impeding effect on future education; that if, for example, a student does poorly in his early reading development, this can have a future effect on such diverse areas as science, history, English, etc. This suggests that various patterns of downstream failure (ultimately contributing to dropout rates) can be studied to determine if "patterns of failure" exist. It is believed a priori, that various patterns can emerge. Of particular interest are: (1) Spread of Effects, where early limited failure will tend to generalize to a number of areas, (2) Convergence of Effects, where a large number of early failures may narrow down to one

or two key areas, perhaps ultimately disappearing as the student improves relative to his peers, (3) Parallel Effects, where students may do poorly in one or a number of areas, but later performance deficiencies will remain in the same areas of earlier deficiencies, and (4) A Diamond Pattern, where earlier failure will be limited, then expand to a number of areas, and then finally diminish in later years. Of particular interest is the extent to which any of these patterns tends to dominate among children who initially do poorly on one or more areas of performance, particularly among a population whose subjects are known to be "disadvantaged".

It is recognized that Iowa is in many respects not comparable to the large urban areas of the East. However, the availability of longitudinal data on any children presents an opportunity to study downstream effects. It is also felt that by sampling from a population which is in a relatively urban area, and which is economically classified as "disadvantaged" we can gain some basis for generalization. It was considered desirable to select from a "disadvantaged" area for a very important reason. Merely selecting subjects based upon poor performance in a typical middle class school, suggests that a major determinent of poor performance will be a limited ability, where as early poor performance among disadvantaged students suggests that a variety of problems beyond or in addition to limited ability may be contributing to poor performance.

It was decided that one way of measuring downstream effects was to study scores on a nationally standardized achievement test. From a psychometric viewpoint, one of the best tests available is the Iowa Test of Basic Skills[1]. Buros' Mental Measurement Yearbook (1961) provides a number of evaluations of this test, all of which suggest that it is an excellent achievement test for the needs of this study. It is administered in grades 3 through 9, and has a number of sub-test scores which can be evaluated. In addition, the Iowa Test of Educational Development provides a logical extension for analysis of secondary school development.

[1](ITBS). Eight sub-test scores were recorded: Vocabulary, Spelling, Reading Usage, Language, Work Study, Arithmetic, and Composite.

DATA COLLECTION

The Iowa Center for Education, located on the University of Iowa campus in Iowa City, Iowa, is one of the few large scale concentrated sources of longitudinal data pertaining to student achievement. Extensive records are kept over many years which show the history of performance among Iowa elementary and secondary students on the Iowa Test of Basic Skills (grades 3 through 9), and on the Iowa Test of Educational Development (for secondary students).

Abt Associates Inc. personnel visited the Iowa Center for a three-day period and collected data on four separate school districts. The largest of these districts, the community of Davenport, provided the majority of subjects.[2] Its selection was based upon the criteria of being urban by Iowa standards and of having a large percentage of Negro students. Once this community was selected, the records of all elementary schools were examined, and three elementary schools were selected for study. The selection criterion was that those schools included in the Sample have a reasonably large percentage of poorly performing students (i.e., below the 33rd percentile on ITBS national norms). This is frequently a characteristic of disadvantaged schools. All students in the third grade in theyear 1958 were included in the population (237). From this group, students were drawn based upon having one or more scores on the ITBS which fell at or below the thirty-third percentile on national test norms. For every succeeding year their scores were examined, and all scores which fell below the thirty-third percentile were recorded. The point was selected as a reasonable threshold for marginal to poor performance (i.e., all students who fall in the lower third of the national standards on the ITBS). In this manner, the data could then be examined to determine the patterns, if any, which characterized poor performance over the years. The size of the total sample was expanded by adding students who entered school the following year in the fourth grade who also performed poorly on the test. Ss were also added from three smaller districts. Thus, the total sample of the four school districts was 258 Ss out of a total population of 610 in the third grade in 1958.

Over the twelve-year period analyzed it became apparent that there was a high level of interschool transfer occurring among the disadvantaged children, and many failed to complete high school. Table 1 indicates the sample distribution.

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[2] This community was also a recipient of a large Title I grant (E&S Ed. Act.). However, the students' records considered were for the year 1958-1965.

Table 1 - Data

Davenport:	Total sample of students in 3rd grade (1958)	Approx.	300
	- low performers (33%-below in 1 through 9 categories)		212
Boon:	Total sample of students in 3rd grade (1958)		190
	- low performers (33% below in 1-3 categories only; differs from Davenport sample where all students below 33% on 1 through 9 categories were included)		22
Ogdon:	Total sample of students in 3rd grade (1958)		40
	-low performers (33% in 1 through 3 categories)		4
Britt:	Total sample of students in 3rd grade (1958)		80
	- low performers (33% in 1 through 3 categories)		20
	Total Population		610
	Total Sample		258*

*This sample size would be somewhat larger if the data from Boon and Ogden, and Britt had included Ss who had scores below the 33 percentile in four or more sub-tests (as was the case with the Davenport Ss).

Visual inspection of the data indicated certain trends which seem important.

(1) Ss who initially do quite poorly on a number of the sub-tests tend to continue to do poorly over the years.

(2) Ss who do poorly in one or two areas and well in the rest on initial ITBS testing, tend to move back toward the mean; where this is not the case, Ss may continue to do poorly in the areas they were initially poor in.

(3) The disadvantaged population for a variety of reasons is the most difficult to obtain logitudinal data on. The schools are less careful or responsible in obtaining data from tests administered in the standardized manner. The disadvantaged population proved to be highly mobile and many students disappeared from the sample around the 9th and 10th grades (either through dropout, dropback, or transfer).

An analysis of the data by means of a simple sorting procedure into various subgroupings yielded the following patterns:

Table 2

Patterns of Distributions for Low Performing Students on IBST

Pattern	N	% Sample	% Population
Spread	50	20	8
Convergent	26	10	4
Parallel	23	10	4
Random	159	60	30
Total Sample	258		
Population	600		

Table 2 indicates that, when the protocols were examined for failures at 33 percentile and below, 60% of the population behaved in a random manner (showing no notable pattern). In many cases, data were insufficient to reflect a pattern (e.g., 2 or 3 years of absent records). In addition, another 10% (Parallel Pattern) finished up the eighth grade in about the same manner as they started. The remaining 30% showed one of two patterns. Approximately 20% showed that when Ss started with a limited poor performance pattern (one or two depressed scores) there was a downstream spread. For example, Ss who initially did poorly only on vocabulary, later showed depressed scores in other areas. In addition, approximately 10% of the sample started out with depressed scores early in their school careers, but were able to improve their scores over the years (i.e., improved their relative standing in relationship to national norms).

The data was then further analyzed to determine the areas of early failure where later spread of effect occurred (20% of this sample).

Table 3

Spread of Effect Among 50 Ss who showed Later Downstream Effects*

Initial ITBS Sub-test Depressed Scores	1 low Score	2 or more low Scores
Vocabulary	9	6
Reading	4	7
Spelling	4	6
Usage	6	5
Language T	1	2
Work Study	3	7
Arithmetic	4	3
Composit	-	-

*The data in Table 3 adds to more than 50, since the Ss in column 2 are counted twice (as they had two or more depressed scores).

For those 50 Ss who showed a spread of effect over time, approximately 75% initially did poorly in a Language area (vis-a-vis arithmetic or work studies). For this group, poor language facility showed greater tendency to have downstream effects.

Further analysis of the patterns of Ss who started out poorly and then improved (i.e., depressed sub-test scores which converged over the years) yielded less of a consistency. A total of 26 Ss fell into this category (10% of the sample). Of these 16 were found to improve their language sub-tests last (before joining the upper 2/3 of the population on all sub-test scores) in comparison to 10 who had the greatest difficulty with Arithmetic or Work Studies. Due to the small N of the Parallel Sample, this finding is not particularly noteworthy.

After examination of the individual protocols, it was apparent that a number of subjects who did not show a particular pattern at the 33 percentile or below, might yield patterns if the upper scores (i.e., those between the 20-33rd percentile were not considered). The records were then re-analyzed to compare the patterns of the 0-10th percentile scores with those between 11-20th percentile scores. In all, 182 records were screened in this manner. Records which already yielded patterns at the 33 percentile were not included in this re-run. The following pattern distribution emerged:

Spread Patterns	19
Converging Patterns	3
Diamond Patterns	10
Parallel Patterns	13
Random Patterns	13
Rejected	124 (insufficient data)

About 10% of this grouping yielded a spread effect. The fact that few in this group yielded a converging pattern is not surprising since the cutoff scores were so low that most students in the sample had long histories of poor performance. Parallel and Diamond effects seem to provide little interpretative meaning.

In summary, the general distribution of patterning among low performing disadvantaged children was rather mixed. The problems of poor attendance, transfer and dropout made longitudinal data difficult to obtain on large numbers of Ss. It seems safe to conclude, however, that among those Ss who initially are marginal in their performance (15-33 percentile on National norms) on ITBS language sub-tests, a significant number will show downstream effects.[3] Approximately 25% of our sub-tests might well have benefited from some compensatory training to help off-set later failures in other areas.[4] It is equally apparent, however, that many disadvantaged youth showed a general tendency to do poorly which was not consistent enough to suggest just which remedial steps might be most appropriate. Further data is needed, particularly in the area of low performance on early grades as it relates to later grade performance.

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[3]It is apparent that use of a similar analysis of data for drop-out students as contrasted with low performing non-drop outs could provide information regarding any areas which significantly distinguish between these two groups. In turn, this would point to critical failure patterns in elementary school performance which then would be a good target for Title I programs.

[4]Here it is recognized that the same variables which contribute to early failure in language sub-tests may contribute to later failures in other areas (e.g., low motivation); however, it is also possible that language failures interact with later failures and that improvement in this area may offset the external contributors, thereby helping a student to improve despite other limitations of his environment.